



Tree Inventory Database Spangdahlem Air Base, Germany

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Introduction

- The Tree Obstacle problem first identified as a result of the 2002 Airfield and Airspace Obstruction Map & Base Comprehensive Plan
- Spangdahlem Airbase Operations Flight and Environmental Flight wanted a solution
- Tree Cutting Survey and Phase I of the Urban Tree Database Inventory became a project under the AFCEE Program in 2003





The Problem

- **Spangdahlem Air Base has been looking to improve the efficiency with which the Urban Trees on Base are managed**
- **Spangdahlem Air Base Terminal Procedures (TERPS) 2002 Airfield and Airspace Obstruction Map identified the presence of trees near the runway tall enough and close enough to compromise safety**
- **Certain flight training could not be conducted at Spangdahlem Air Base due to the Tree Obstacles compromising aircraft and aircrew safety**
- **Mission requirements changing to accommodate larger aircraft types such as C5 Galaxy and C130 Hercules with a different**





The Solution

Short Term

Solution

Tree Cutting Survey for all tall trees within the approach flight path to validate Tree Obstacles of 100 feet or more

Long Term

Solution

Tree Inventory Database which contains:

- **Height of each tree**
- **Exact location of each tree**



Tree Cutting Survey

Objectives

- 1. Establish all Tree Obstacles of 100 feet or higher at the 05 and 23 End of the runway**
- 2. Establish all other Tree Obstacles of 100 feet or higher within the boundaries of the Base**
- 3. Establish the height of trees at the perimeter line of the forest on and off Base**



Tree Cutting Survey





Tree Cutting Survey

Results

- 4 Tree Obstacles higher than 100 ft
- 3 Tree Obstacles higher than 90 ft
- 1 Forest Area with trees higher than 100 ft

Obstacle Number	Scientific Name	German Name	English Name	Tree Height (m)	Tree Height (ft)	Typical annual Growth Rate in cm (1 cm = 0.01 m)	Tree Growth in 5 years	Tree Growth in 10 years
161	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	23.4	76.66	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
170	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	24.9	81.69	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
173 A	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	24.1	78.96	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
173 B	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	23.2	76.06	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
176 A	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	30.4	99.85	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
176 B	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	28.8	94.54	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30
3115	<i>Picea omorika</i>	Serbische Fichte, Omorika Fichte	Serbian Spruce	25.4	83.17	0.8 – 1.0 (grows usually over 100 feet)	4.0 – 5.0	8.0 – 10.0
N3 Middle School	<i>Populus x canadensis</i>	Kanadische Pappel	Carolina Popular	30.7	100.78	2.0 – 3.0 (very fast growing up to 25 years, Tree grows up to 40 m/131 ft)	10 - 15	20 - 30



Tree Inventory Database

Objectives

- 1. Incorporate the findings of the Tree Cutting Survey**
- 2. Create a user friendly and access-controlled Management Tool used at any PC**
- 3. The Database contains: Tree Species, Tree Location, Tree Height & Girth, Photograph, Scar Information, and Overall Condition**



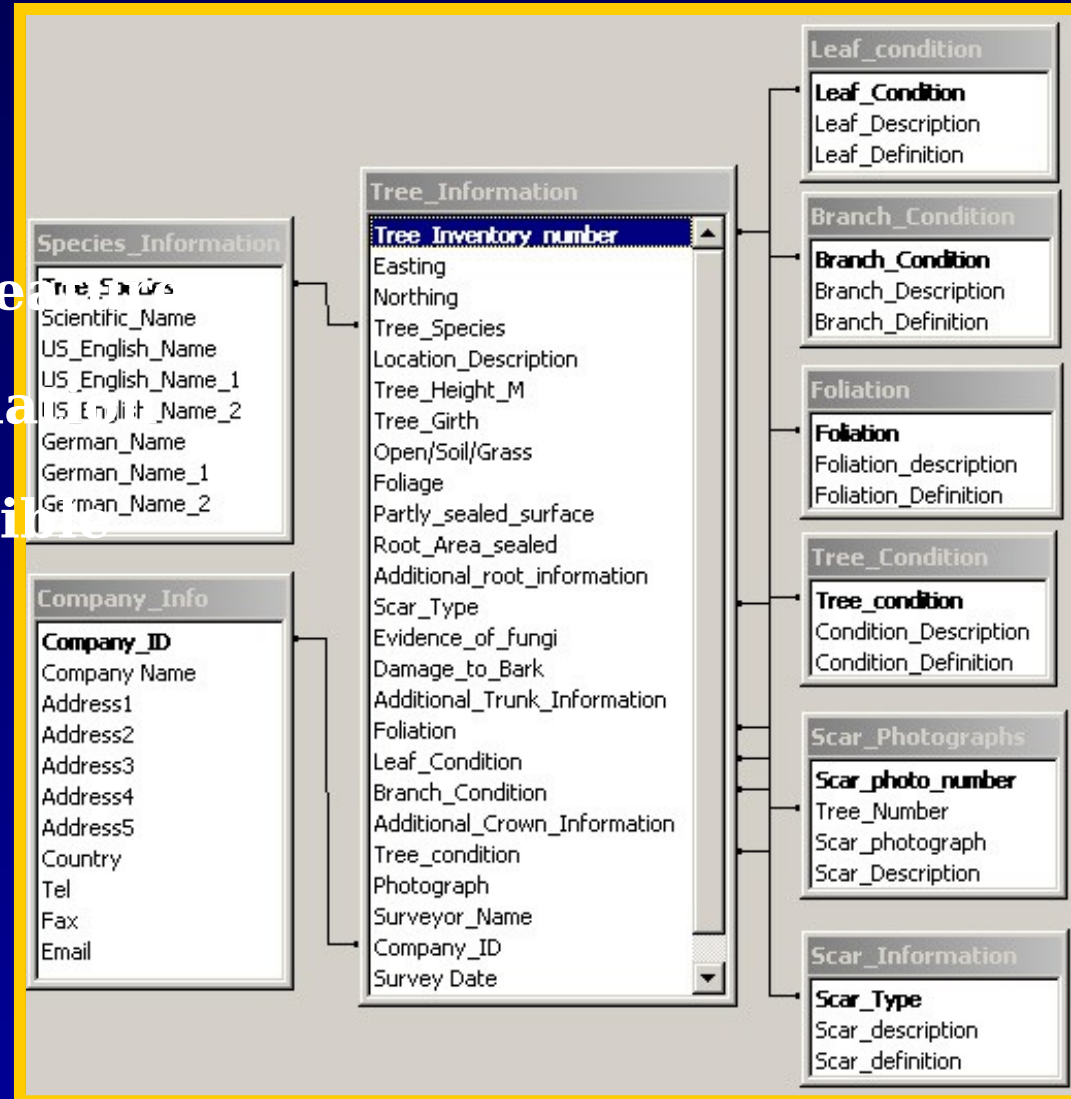
Tree Inventory Database

Database Structure

Database Relationship

- Main table contains all features
- All tables One-To-One relationship
- Customized reports possible
- Tree Number is unique identifier

What does it mean?





Tree Inventory Database

Opening Screen

Main Form

Reports

Data Entry Menu

Open Analysis Form

User Manual

Integrity First
Service Before Self
Excellence In All We Do
ORCESTRATION
SEEK ATTACK DESTROY

Quit Database and
Return to Main Menu



Tree Inventory Database

Data Entry Screen

Data Entry Form

Tree Information Form

Open Scar Information Form

Tree Species Entry Form

Open Organization Information Form





Tree Inventory Database

Tree Information

Three Tabs

- General Details
- Tree Photograph
- Definitions

Pull Down

Menu

- Species Name
- Scars
- Branches
- Foliation
- Leaves
- Tree Condition
- Organization

Tree_Information

General Details | Tree Photograph | Definitions

Easting* Northing* Species Name:

Location Description

Tree Height In Meters* Tree Girth at 1.3M*

Root Area	Tree Trunk	Tree Top - Crown
Open Soil or Grass ☒	Scars:	Branch Conditions: Good Condition
Surrounded by Vegetation ☐	Evidence of Fungi ☐	Foliation: Full
Partly Sealed Surface ☐	Damage to Bark ☐	Condition of Leaves: Majority of leaves dead/No l
Additional Root Information 	Additional Trunk Information Two scars at the lower base of the trunk.
Scar I - 22 cm well heald.
Scar II - 18 cm well heald	Additional Crown Information

Overall Tree Condition: Surveyor Name: Organization: Survey Date:

Record: of 358



Tree Inventory Database

Pull Down Menus

Tree Information

Genus: **Acer platanoides**

East: **Acer platanoides** Norway Maple Europäischer Sp
Local: **Ulmus x hollandica** Dutch Elm Holländische Ul
Behavior: **Ulmus carpinifolia** Smoothleaf Elm Feld Ulme
Tree: **Acer campestre** Field Maple Feld-Ahorn
Betula pendula European White Bir Hängebirke
Sorbus intermedia Swedish Whitebea Schwedische M
Sorbus aria Common Whitebea Echte Mehlbeer
Fraxinus excelsior European Ash Gemeine Esche

Open Soil or Grass ☒ Scars: **New Scars**
Surrounded by Vegetation ☐
Partly Sealed Surface ☐
Additional Root Information

Two scars at the lower base of the trunk.
Scar I - 22 cm well heald.
Scar II - 18 cm well heald

Branch Conditions: **Good Condition**
Foliation: **Full**
Condition of Leaves: **Majority of leaves dead/No**
Additional Crown Information

Overall Tree Condition: **Good Condition**
Survey Date: 09 July 2003
Add New Information Exit and Save

Record: 1



Tree Inventory Database

Other Data Entry

Tree Species Entry Form

Tree_scar_entry_form

Tree Unique Identifier: 11

Species Name: Acer platanoides

Location Description: Behind caddyshack at Building 900. Adjacent to perimeter road, in a group of trees.

Scars: Old Healed Scars

Scar Photographs:

Scar Photograph	Scar Description
o Editor 3.0 Photo	Old, well healed scar, 23 cm at th
*	

Record: 1 of 32

Exit and Save

Tree Scar Entry Form

Tree Species Entry Form

Scientific Name (Latin): Carpinus betulus

US English Name: Hornbeam

Alternative US English Name 1: European Hornbeam

Alternative US English Name 2:

German Name: Gemeine Hainbuche

Alternative German Name 1: Hainbuche

Alternative German Name 2: Weißbuche

Add new Information Exit and Save

Record: 15 of 45

Organization Entry Form

Organisation Entry Form

Organization Name: Parsons

Address1: 5th Floor

Address2: 4 Grosvenor Place

Address3: London

Address4: SW1X 7PG

Address5:

Country: England

Tel: +44 (0)20 7823 07000

Fax: +44 (0)20 7235 8193

Email: heiko.geithner@parsons.com

Add new Information Exit and Save

Record: 1 of 1



Tree Inventory Database

Open Analysis

Analysis Forms

Tree Inventory Number

Tree Species (US English Name)

Select Trees taller Than: Meters



Condition_Description

Scar Information



Tree Inventory Database

Report View

Spangdahlem Airbase Tree Survey Report

Easting: ☐ Northing: ☐ Species Type: Bulkhead
Tree Girth at 1.3M: 0.6 Tree Unique Identifier: 2
Location Description: Tree Height In Meters: 9.1
Behind caddyshack at Building 500. Adjacent to perimeter road, in a group of trees.

Open/Soil/Grass Surround: ☒ Additional Root Information:
Foliage Surround: ☐
Partly Sealed Surface: ☐
Root area sealed surround: ☐

Scars:
Evidence of Fungi: ☐ Additional Trunk Information:
Damage to Bark: ☐

Foliation: Full Additional Crown Information:
Condition of Leaves: Mostly or tissues dead
Branch Condition: Good Condition

Overall tree condition:
Good Condition
Surveyor Name:
Gellner, Hiko
Survey Date:
July 2003



The Report View can
be printed for each
tree and for each
Analysis Result



Tree Inventory Database

Spreadsheet View

The Spreadsheet View can be printed for all trees and for all analysis results. The spreadsheet can be used in MS Excel for further statistical analysis

Tree_condition_cat : Select Query

Tree Unique Identifi	Easting	Northing	Species Name	Location_Description	Tree Height In Meter	Tree Girth at 1.3M	Open/Soil/Gras
38	0	0	Sorbus aria	South of Building 1.	2.3	0.12	☒
47	0	0		South of Building 84, north of the golf	5.4	0.23	☒
120	0	0	Picea abies	Line of conifers at the northern site of	18	0.69	☒
132	0	0	Picea abies	Line of conifers at the northern site of	16.7	0.96	☒
139	0	0	Betula pendu	Line of trees between Arnold Boulevar	11.8	0.46	☒
150	0	0	Picea abies	West of Building 38 - line of trees aro	17	1.43	☒
154	0	0		West of Building 38 - line of trees aro	15.4	0.93	☐
180	0	0	Betula pendu	Along the driveway to Building 42, op	4.8	0.13	☒
186	0	0	Picea aspera	Right of the entrance of Building 42.	11.4	0.73	☒
257	0	0	Cornus mas	Between Building 33 and Building 34.	2.4	0.1	☒
298	0	0	Ribes Petrae	Between Building 158 and Taxiway C	3.8	0.11	☒
343	0	0	Prunus aviurr	Between Building 257 and Ramey Blv	4.9	0.39	☒
349	0	0	Chamaecypa	Between Building 220 and Building 24	3.1	0.11	☒

Record: 15 of 16



Tree Inventory Database

Map

For each tree the exact position was recorded using a GPS System enabling the creation of a point map locating each tree on the Base





Tree Inventory Database

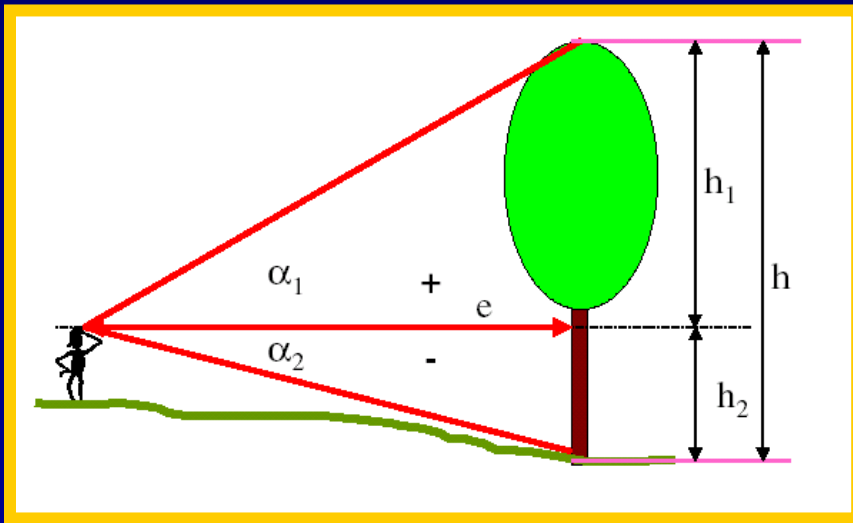
Equipment Used

Tree height was measured using a Vertex III System The Vertex III measures the tree height within an accuracy of three inches

Transponder



Vertex III





Tree Inventory Database

Equipment Used

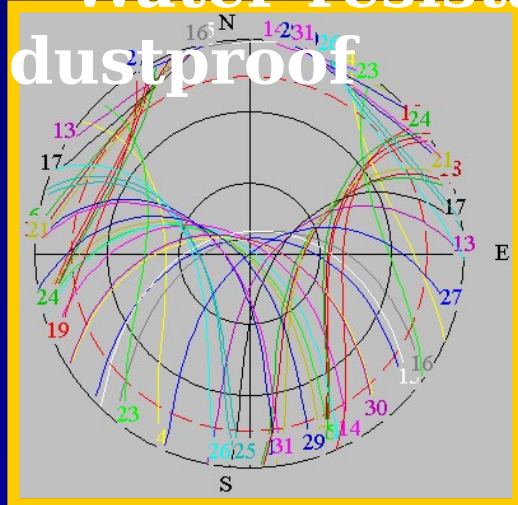
Trimble® GeoXT™ GPS Data Logger

Rugged Field Unit

- Meter accuracy for uncorrected data
- Inbuilt GPS antenna
- Water-resistant, shock-resistant,



dustproof



GPS Data Post-Processing

- Trimble® Base Station in Zurich (250 miles)
- Data is available for 10 days at the Internet
- Sub-meter accuracy after **post-**



Tree Inventory Database

Technical Summary

- **Tree Inventory Database format is Microsoft® Access 2000**
- **Database contains 803 trees up to date (estimated 2.500)**
- **Database is 2 GB due to the photographs (estimated 5 GB)**
- **Tree height was measured with the Vertex III**
- **Tree location was logged with Trimble® GeoXT™ Data Logger**
- **Field work lasted 3 weeks during vegetation**



Tree Inventory Database

Current Use

The Tree Inventory Database verifies the condition of each tree with regard to health and safety issues, trend analysis, construction activities, pest management and tree cutting permits from the Federal Forestry Authorities. Furthermore, it is also being utilized by Spangdahlem Air Base Terminal Procedures to establish safe flight paths and to verify tree obstacles higher than 100 feet.



Questions?



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